

II. Amendments to the Claims

This listing of claims replaces without prejudice all prior versions and listings of claims in the application:

Listing of Claims:

Claims 1-26 (Cancelled)

27. (New) An injection molding nozzle comprising:

a metallic nozzle core having (i) an inside surface configured to contact a pressurized injection material, and (ii) an outside surface, said metallic nozzle core being configured to withstand the pressure of the pressurized injection material;

an alternating current heater device disposed against and in contact with said metallic nozzle core; and

an electrical insulator disposed between said metallic nozzle core and said alternating current heater device;

said metallic nozzle core being configured to receive heating from said alternating current heater device, without an auxiliary cooling structure.

28 An injection molding nozzle as in claim 27 where heating is selected from the group of:

- (i) resistive;
- (ii) inductive; and
- (iii) resistive and inductive.

29. (New) An injection molding nozzle according to Claim 27 or 28, wherein at least one of the metallic nozzle core inner surface and outer surface includes a groove, and wherein said alternating current heater device is disposed in said groove.

30. (New) An injection molding nozzle according to Claim 27 or 28, wherein said groove comprises a helical groove, and wherein said alternating current heater device comprises a helical coil disposed in said helical groove.

31. (New) An injection molding nozzle according to Claim 30, wherein said alternating current heater device helical coil and said electrical insulator are pressed into said helical groove.

32. (New) An injection molding nozzle according to Claim 30, wherein said alternating current heater device comprises a high resistivity material, and wherein said electrical insulator comprises a thermally conductive material.

33. (New) An injection molding nozzle according to Claim 27 or 28, wherein said electrical insulator is in contact with said metallic nozzle core inner surface.

34. (New) An injection molding nozzle according to Claim 33, wherein said electrical insulator has an outer surface that is substantially even with the outer surface of the metallic nozzle core.

35. (New) An injection molding nozzle according to Claim 27 or 28, wherein said electrical insulator is in contact with said metallic nozzle core outer surface.

36. (New) An injection molding nozzle according to Claim 35, wherein said electrical insulator has an outer surface that is substantially even with the inner surface of the metallic nozzle core.

37. (New) An injection molding nozzle according to Claim 27 or 28, wherein said electrical insulator comprises an electrically insulative material that is also thermally conductive, and a metallic sheath disposed around the insulative material.

38. (New) An injection molding nozzle according to Claim 27 or 28, wherein said alternating current heater device comprises a nickel chromium alloy.

39. (New) An injection molding nozzle according to Claim 27 or 28, further comprising a metallic yoke disposed around said metallic core.

40. (New) An injection molding nozzle according to Claim 39, wherein the metallic core and the metallic yoke each comprises a ferromagnetic material.

41. (New) An injection molding nozzle according to Claim 39, wherein the metallic yoke includes a sleeve fitting tightly against said alternating current heater device and said electrical insulator.

42. (New) An injection molding nozzle according to Claim 41, wherein the sleeve is substantially thinner than the metallic core.

43. (New) An injection molding nozzle according to Claim 41, wherein the sleeve is approximately the same thickness as the metallic core.

44. (New) An injection molding nozzle according to Claim 27 or 28, wherein said alternating current heater device is disposed in a coil, and further comprising metallic structure disposed between the coils of said alternating current heater device.

45. (New) Molding machine heating apparatus, comprising:
a ferromagnetic core configured to transmit a pressurized molding material; and
an alternating current heater in contact with at least one of (i) an inside surface of said ferromagnetic core, and (ii) an outside surface of said ferromagnetic core, said alternating current heater being configured to (i) conductively heat said ferromagnetic core, and (ii) inductively heat said ferromagnetic core in the absence of induction-heating cooling structure;
said alternating current heater comprising a resistive element surrounded by an electrically-insulating but thermally-conducting insulator.

46. (New) Molding machine heating apparatus according to Claim 45, wherein said alternating current heater is pressed into a groove in at least one of (i) the inside surface of said ferromagnetic core, and (ii) the outside surface of said ferromagnetic core.

47. (New) Molding machine heating apparatus according to Claim 45, wherein said alternating current heater comprises a nickel-chromium element surrounded by a magnesium oxide insulator.

48. (New) Molding machine heating apparatus according to Claim 45, wherein said ferromagnetic core comprises a thixotropic injection molding nozzle.

49. (New) Molding machine heating apparatus according to Claim 45, wherein said alternating current heater is disposed in a liner in contact with said ferromagnetic core.

50. (New) Molding machine heating apparatus according to Claim 45, wherein said alternating current heater is disposed on an inside surface of said ferromagnetic core, and further comprising a wear-resistant layer disposed over said alternating current heater.

51. (New) Molding machine heating apparatus according to Claim 45, wherein said wear-resistant layer is disposed with a sufficient thickness such that an inside surface of said wear-resistant layer provides a substantially smooth bore.

52. (New) Molding machine heating apparatus according to Claim 45, further comprising a ferromagnetic yoke coupled to an outside of said ferromagnetic core such that said alternating current heater also heats said ferromagnetic yoke conductively and inductively.

53. (New) An injection molding machine heater, comprising:

a tubular core element having a bore configured to transmit a pressurized molding material;

an alternating current heater in contact with said core element and configured to heat said core element both inductively and conductively, in the absence of induction-heating cooling structure, said alternating current heater comprising an electrically conductive element surrounded by an electrical insulator, said electrical insulator configured to conduct heat from said electrically conductive element to said core element; and

a protective layer disposed over said alternating current heater.

54. (New) An injection molding machine heater according to Claim 53, wherein said alternating current heater is disposed in contact with an inside surface of said core element.

55. (New) An injection molding machine heater according to Claim 54, wherein said alternating current heater is pressed into a helical groove in the inside surface of said core element.

56. (New) An injection molding machine heater according to Claim 53, wherein said alternating current heater is disposed in contact with an outside surface of said core element.

57. (New) An injection molding machine heater according to Claim 56, wherein said alternating current heater is pressed into a helical groove in the outside surface of said core element.

58. (New) An injection molding machine heater according to Claim 56, wherein said alternating current heater is pressed into a helical groove in an inside surface of a liner disposed adjacent the outside surface of said core element.

59. (New) An injection molding machine heater according to Claim 53, further comprising a yoke element coupled to said core element, said alternating current heater contacting said yoke element and being configured to heat said yoke element both inductively and conductively.

60. (New) An injection molding machine heater according to Claim 53, wherein said alternating current heater is disposed in a coil, and further comprising a metal structure disposed between the coils.

61. (New) An injection molding machine heater according to Claim 53, wherein said alternating current heater comprises a nickel-chromium element surrounded by a magnesium oxide insulator.